

National Climatic Data Center

DATA DOCUMENTATION

FOR

DATA SET 9641I (DSI-9641I)

**Daily Normal Growing Degree Units to Selected Base Temperatures
1951-1980**

December 20, 2002

National Climatic Data Center
151 Patton Ave.
Asheville, NC 28801-5001 USA

Table of Contents

Topic	Page Number
1. Abstract.....	3
2. Element Names and Definitions:	4
3. Start Date.....	6
4. Stop Date.....	6
5. Coverage.....	6
6. How to order data.....	6
7. Archiving Data Center.	7
8. Technical Contact.....	7
9. Known Uncorrected Problems.....	7
10. Quality Statement.....	7
11. Essential Companion Data Sets.....	7
12. References.....	7

1. **Abstract:** This data set contains Daily Normal Growing Degree Units (GDU) to selected base temperatures for the 1951-1980 period. The daily GDU values in this data set represent the 30-year average GDU value for a particular base temperature to one decimal point. The Growing Degree Unit normals were also published as tabular values in Climatology of the United States No. 20. Graphs of cumulative daily growing degree units for bases 40, 45, 50, 55, and 60 degrees Fahrenheit for all stations in this data set are also available on microfiche at NCDC.

Growing degree units are used often in agriculture as a guide in crop scheduling. They relate air temperature to plant growth and maturation, and are sometimes used for classifying regional agroclimates.

Data from the NCDC Summary of the Day (SOD) data set (DSI-3200) were used to produce the Growing Degree Unit Normals. The SOD temperature data were put through extensive validation and interpolation procedures based upon the departure from the normal in conjunction with those from surrounding stations. As a result, the growing degree units were produced from high quality, serially-complete station records of daily maximum and minimum temperatures. This alleviated the many possible problems associated with developing growing degree unit statistics from an incomplete and poor quality data set.

Station values of average daily growing degree units were computed for ten base temperatures (degrees Fahrenheit): 40, 45, 50, 55, 57, 60, 65, 70, and the truncated bases 48/86 and 50/86. Of these bases 57, 65, 70, and 48/86 were not published in Climatology of the United States No. 20, but are only available in this data set. The bases correspond to many of the common phenological cycles in the United States. The truncated bases (48/86 and 50/86) represent adjustments of the daily maximum and minimum temperatures, which better describes specific growth patterns for certain crops (specifically Corn). Here, minimum temperatures below the lower bases are set to the lower bases (48 or 50) and maximum and/or minimum temperatures above the upper base are set to the upper base (86). Average daily station values of GDU were computed for each base temperature by the equation:

$$\overline{\text{GDU}} = N^{-1} \sum_{I=1}^N \text{GDU}_i = N^{-1} \sum_{I=1}^N \frac{(\text{Tmax}_i + \text{Tmin}_i)}{2} - \text{Base}$$

Where:

GDU_i = Growing degree units for the date from year i ,

Tmax_i = Maximum temperature for the date from year i ,

Tmin_i = Minimum temperature for the date from year i ,

Base = Base temperature

N = 30 years

In the above equation, when the average of Tmax_i and Tmin_i was less than the base temperature, the value for GDU_i was set to zero, and the average was always rounded up to the nearest degree. The values of GDU for each base temperature were then summed to produce the monthly and accumulated monthly totals produced in Climatology of the United States No. 20.

The data in this file are in state, station number, base temperature, and month sort. Data are blocked 12 (10 blocks per station) with each block containing 1656 characters (138 characters each record).

:

3:

2. Element Names and Definitions: The data are archived in a fixed length ASCII format. The total data volume is 51 megabytes. The data are sorted by the state number (ISTATE) as the primary key followed by station (ISTATN), base temperature (IBASE), and month(IMONTH) as secondary keys. Data are blocked 12 (10 blocks per station) with each block containing 1656 characters. There are 138 characters per record.

<u>Element</u>	<u>Type</u>	<u>Width</u>	<u>Start Column</u>	<u>End Column</u>
ISTATE	Integer	2	1	2
ISTATN	Integer	4	3	6
IDIV	Integer	2	7	8
IMONTH	Integer	2	9	10
IBASE	Integer	4	11	14
IDAY(1)	Integer	4	15	18
IDAY(2)	Integer	4	19	22
IDAY(3)	Integer	4	23	26
IDAY(4)	Integer	4	27	30
IDAY(5)	Integer	4	31	34
IDAY(6)	Integer	4	35	38
IDAY(7)	Integer	4	39	42
IDAY(8)	Integer	4	43	46
IDAY(9)	Integer	4	47	50
IDAY(10)	Integer	4	51	54
IDAY(11)	Integer	4	55	58
IDAY(12)	Integer	4	59	62
IDAY(13)	Integer	4	63	66
IDAY(14)	Integer	4	67	70
IDAY(15)	Integer	4	71	74
IDAY(16)	Integer	4	75	78
IDAY(17)	Integer	4	79	82
IDAY(18)	Integer	4	83	86
IDAY(19)	Integer	4	87	90
IDAY(20)	Integer	4	91	94
IDAY(21)	Integer	4	95	98
IDAY(22)	Integer	4	99	102
IDAY(23)	Integer	4	103	106
IDAY(24)	Integer	4	107	110
IDAY(25)	Integer	4	111	114
IDAY(26)	Integer	4	115	118
IDAY(27)	Integer	4	119	122
IDAY(28)	Integer	4	123	126
IDAY(29)	Integer	4	127	130
IDAY(30)	Integer	4	131	134
IDAY(31)	Integer	4	135	138

ISTATE is an Integer variable that refers to the USA state code. The range of values is (01-48, 50, 51)

ISTATN is an Integer variable that refers to cooperative station number. Range of values is 0001-9999.

IDIV is an Integer variable that refers to the climate division number. Range of values is 01-10

IMONTH (Character 9-10) is an integer variable that refers to the month of this specific record which contains daily values of growing degree units. Range of values is 01-12.

IBASE (Characters 11-14) is an integer variable that refers to the base temperature. Average daily growing degree units were computed for ten base temperatures (degrees Fahrenheit): 40, 45, 50, 55, 57, 60, 65, 70, and truncated bases of 48/86 and 50/86. The bases correspond to many phenological cycles in the United States. The truncated bases (48/86 and 50/86) represent adjustments of the daily maximum and minimum temperatures, which better describes specific growth patterns. Minimum temperatures were set to the lower bases (48 or 50) and maximum and/or minimum temperatures above the upper base were set to the upper base (86). For example, base 40 is coded 0040 while base 48/86 is coded 4886.

IDAY (1) (Characters 15-18) is an integer variable. This is the normal daily growing degree unit (GDU) for Day 1. These daily GDU values represent the 30-year average GDU value for a particular base temperature to one implied decimal point (i.e., 515 = 51.5 GDU). A value of -999 represents an impossible date (i.e., Feb. 30, etc.). A value of -111 represents a GDU value greater than zero but less than .05. Note that when the average of the maximum and minimum temperatures was less than the base temperature, the value for GDU is set to zero, and the average is always rounded to the nearest degree. Range of values is -999 to 999. Positive values contain blanks in left most digits (i.e. no A+@ sign.)

IDAY (2) (Characters 19-22) See IDAY (1) for definition

IDAY (3) (Characters 23-26) See IDAY (1) for definition

IDAY (4) (Characters 27-30) See IDAY (1) for definition

IDAY (5) (Characters 31-34) See IDAY (1) for definition

IDAY (6) (Characters 35-38) See IDAY (1) for definition

IDAY (7) (Characters 39-42) See IDAY (1) for definition

IDAY (8) (Characters 43-46) See IDAY (1) for definition

IDAY (9) (Characters 47-50) See IDAY (1) for definition

IDAY (10) (Characters 51-54) See IDAY (1) for definition

IDAY (11) (Characters 55-58) See IDAY (1) for definition

IDAY (12) (Characters 59-62) See IDAY (1) for definition

IDAY (13) (Characters 63-66) See IDAY (1) for definition

IDAY (14) (Characters 67-70) See IDAY (1) for definition

IDAY (15) (Characters 71-74) See IDAY (1) for definition

IDAY (16) (Characters 75-78) See IDAY (1) for definition
IDAY (17) (Characters 79-82) See IDAY (1) for definition
IDAY (18) (Characters 83-86) See IDAY (1) for definition
IDAY (19) (Characters 87-90) See IDAY (1) for definition
IDAY (20) (Characters 91-94) See IDAY (1) for definition
IDAY (21) (Characters 95-98) See IDAY (1) for definition
IDAY (22) (Characters 99-102) See IDAY (1) for definition
IDAY (23) (Characters 103-106) See IDAY (1) for definition
IDAY (24) (Characters 107-110) See IDAY (1) for definition
IDAY (25) (Characters 111-114) See IDAY (1) for definition
IDAY (26) (Characters 115-118) See IDAY (1) for definition
IDAY (27) (Characters 119-122) See IDAY (1) for definition
IDAY (28) (Characters 123-126) See IDAY (1) for definition
IDAY (29) (Characters 127-130) See IDAY (1) for definition
IDAY (30) (Characters 131-134) See IDAY (1) for definition
IDAY (31) (Characters 135-138) See IDAY (1) for definition

3. **Start Date:** This data set represents a group of summary statistics. The beginning period of record used in generating these statistics is 19510101.

4. **Stop Date:** This data set represents a group of summary statistics. The ending period of record used in generating these statistics is 19801231.

5. **Coverage:** Contiguous US plus Alaska and Hawaii

- a. Southernmost Latitude: 18N
- b. Northernmost Latitude: 65N
- c. Westernmost Longitude: 160W
- d. Easternmost Longitude: 65W

6. **How to Order Data:**

Ask NCDC's Climate Services about the cost of obtaining this data set.
 Phone: 828-271-4800
 FAX: 828-271-4876
 E-mail: NCDC.Orders@noaa.gov

:
 :
 :

7. **Archiving Data Center:**

National Climatic Data Center
Federal Building
151 Patton Avenue
Asheville, NC 28801-5001
Phone: (828) 271-4800.

8. **Technical Contact:**

National Climatic Data Center
Federal Building
151 Patton Avenue
Asheville, NC 28801-5001
Phone: (828) 271-4800.

9. **Known Uncorrected Problems:** There are no known uncorrected problems in this data set.

10. **Quality Statement:** The daily maximum and minimum temperature data used to derive the normal growing degree day units were put through extensive validation and interpolation procedures based upon the departure from the normal in conjunction with those from surrounding stations. As a result, the growing degree units were produced from high quality, serially-complete station records of daily maximum and minimum temperatures. This alleviated the many possible problems associated with developing growing degree unit statistics from an incomplete and poor quality data set.

11. **Essential Companion Datasets:** The use of NCDC's Station History file (DSI-9767) is required in order to determine metadata on each station (name, location, elevation, etc.) This can be accomplished by comparing the station number in bytes 1 through 6 of this data set with the corresponding station number in the Station History data set.

12. **References:**

Climatology of the United States No. 20: Climatic Summaries for Selected Sites, 1951-80. U.S. Department of Commerce, National Climatic Data Center, Asheville, NC; 1984. (Available for individual sites and by state groupings.)

Climatology of the U.S. No. 20. Environmental Information Summaries C-26. 1985; 15 pp.

Koss, W.J., Owenby, J.R., Steurer, P.M., and Ezell, D.S., 1988: Freeze/Frost data, Climatology of the U.S. No. 20, Supplement No. 1., U.S. Department of Commerce, National Climatic Data Center, Asheville, NC; 186 pp.

Steurer, P.M., 1985: Creation of a serially complete data base of high quality maximum and minimum temperatures. Unpublished document, U.S. Department of Commerce, National Climatic Data Center, Asheville, NC; 21 pp.

Van Den Brink, C., Strommen, N.D., and Kenworthy, A.L., 1971: Growing Degree Days in Michigan. Michigan State University Agricultural Experiment Station Research Report No. 131: 50 pp.

:
:
:

⋮

9: